

# RAIN GARDEN TRAINING

## RAIN GARDEN SITE SELECTION, INSTALLATION & MAINTENANCE

*Rain Garden Training for Landscapers  
March 30, 2011*

**RUTGERS**  
New Jersey Agricultural  
Experiment Station



# WELCOME

- Please feel free to use your rain garden manual to take notes and follow the PowerPoint presentation
- Look for the corresponding page number on the upper right corner of each slide



## RAIN GARDEN MANUAL OF NEW JERSEY







DEFINING A RAIN GARDEN

# INTRODUCTION

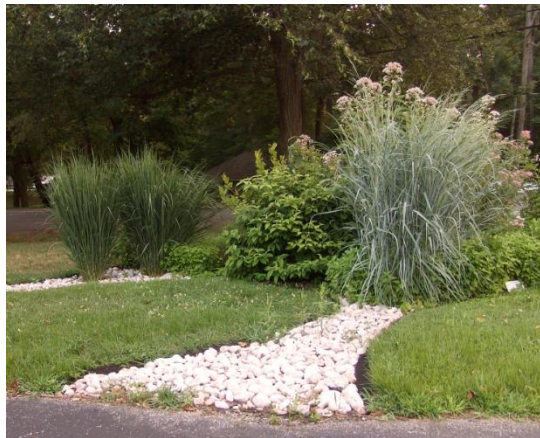






# WHY A RAIN GARDEN?

- Rain gardens are a simple, cost-effective tool homeowners, municipalities, and schools can use to reduce stormwater runoff, improve groundwater recharge, and trap nonpoint source pollutants before they reach our waterways







# STORMWATER DIAGRAM

## CAPTURE

A rain garden catches runoff and holds standing water for no more than 24 hours

## FILTER

In the soil, microbes break down pollutants and nutrients washed in by the rain

## INFILTRATE

Deep-rooted plants loosen the soil, creating a sponge zone. Water soaks in and groundwater aquifers are recharged

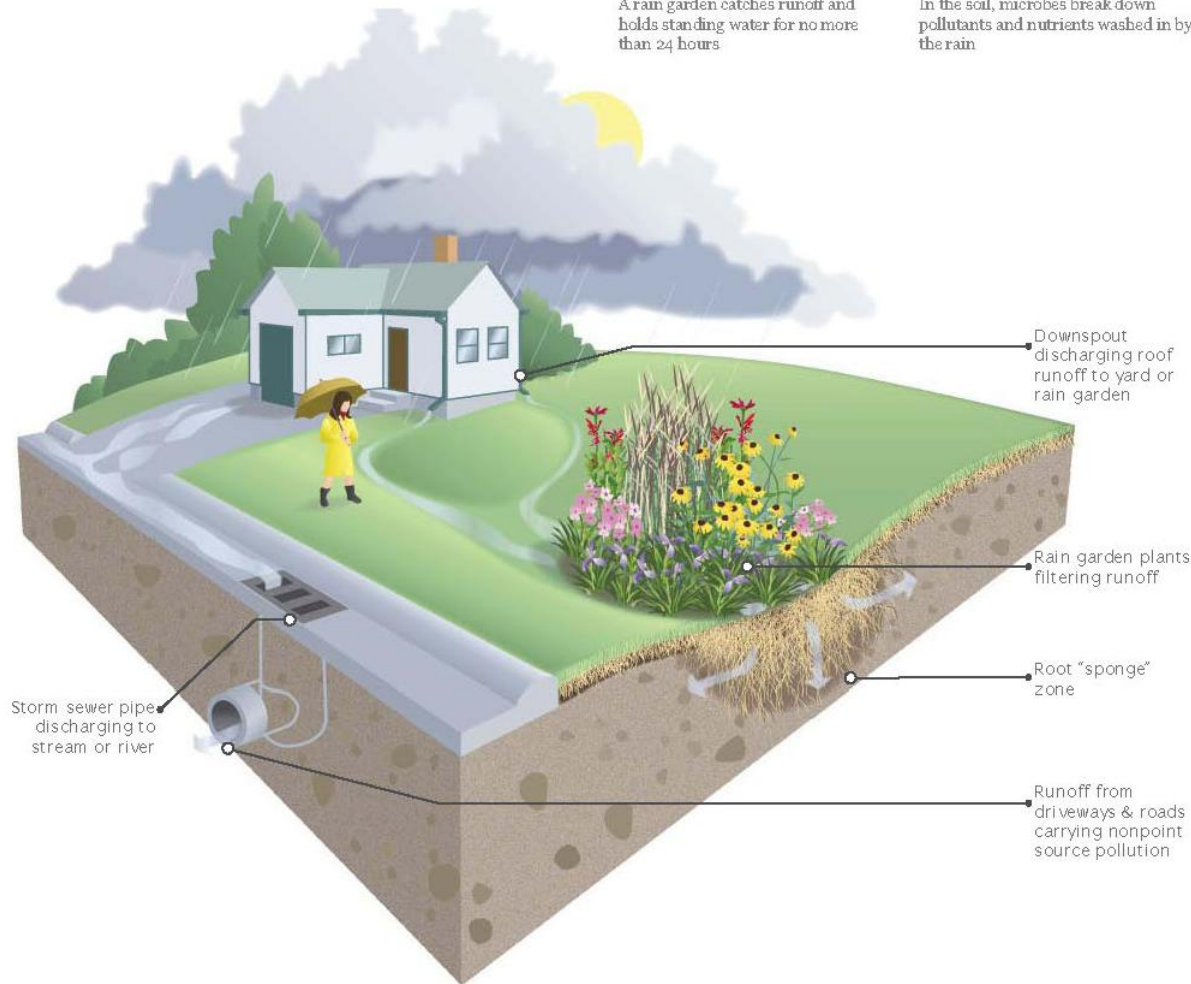


Image Courtesy of the City of  
Maplewood, MN



# STORMWATER AND YOU

- Development activities throughout the US are rapidly covering the land with impervious surfaces like roadways, driveways, and rooftops
- These impervious surfaces increase the amount of stormwater runoff and nonpoint source pollutants carried to nearby waterways







# WHAT IS A RAIN GARDEN?

- A rain garden is a landscaped, shallow depression that captures, filters, and infiltrates stormwater runoff.
- The rain garden removes nonpoint source pollutants from stormwater runoff while recharging groundwater.



# WHAT IS A RAIN GARDEN?

- GOALS

1. Serve as a functional system to capture, filter, and infiltrate stormwater runoff at the source
2. Aesthetically pleasing garden

“Nonpoint source pollution” is also called “people pollution.” It is the pollution that comes from our everyday lives. It is the fertilizers that wash off our farms and lawns. It is the pet waste that washes into our streams. It is the sediment (or soil) that erodes from our lands into our local waterways. It is the oil and grease that comes from our parking lots. Finally, it is the pollutants such as nitrogen, phosphorous, and heavy metals that settle out of our atmosphere onto our roads and rooftops. When it rains, the stormwater runoff carries nonpoint source pollution and may ultimately wash it to our waterways.





# A RAIN GARDEN CAN BE...



a butterfly habitat



along a sidewalk



trees and shrubs



a parking island



a wet meadow

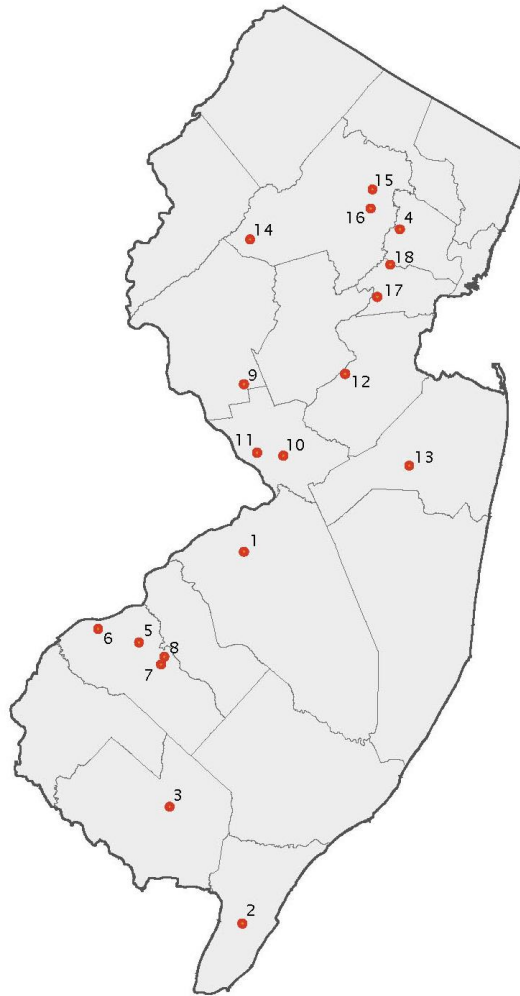


a perennial garden

- Rain gardens can be readily implemented throughout our communities to begin the process of re-establishing the natural processes of the land



# RAIN GARDENS IN NJ



## Burlington County

1. Rutgers Cooperative Extension of Burlington County

## Cape May County

2. Rutgers Cooperative Extension of Cape May County

## Cumberland County

3. Wheaton Arts and Cultural Center

## Essex County

4. Essex County Environmental Center

## Gloucester County

5. Holy Nativity Lutheran Church
6. Greenwich Township Library
7. Atkinson Park
8. Hurffville Elementary School

## Hunterdon County

9. Marion F. Clawson Memorial Park

## Mercer County

10. Mercer County Community College
11. Delaware River Basin Commission

## Middlesex County

12. Rutgers Cooperative Extension of Middlesex County (EARTH Center)

## Monmouth County

13. Rutgers Cooperative Extension of Monmouth County (Agriculture Building)

## Morris County

14. Washington Township Library
15. Leonard Park
16. Parsippany-Troy Hills Town Hall

## Union County

17. Fanwood Memorial Library
18. Hanson House/ Hanson Park Conservancy  
Reeves-Reed Arboretum

For more information on demonstration rain gardens near you,  
visit [www.water.rutgers.edu](http://www.water.rutgers.edu)



# HOW DO YOU BUILD A RAIN GARDEN?



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- The design of a rain garden involves understanding several interrelated principles including:
  - The hydrologic cycle or water cycle,
  - Nonpoint source pollution,
  - Natural resource conservation,
  - Wildlife habitat,
  - Nutrient cycles,
  - Soil chemistry,
  - Horticulture,
  - Landscape architecture,
  - Design,
  - Ecology, and more.







SITE SELECTION & DESIGN

# PLANNING YOUR RAIN GARDEN







# GOALS & STRATEGIES

- GOALS:
  1. Design and build a rain garden
  2. Better manage stormwater runoff
  3. Reduce irrigation of the lawn and landscape
- STRATEGIES:
  1. Plant only native plants in the rain garden
  2. Catch 50% of runoff in the rain garden
  3. Use captured water in rain barrels to water plants in the rain garden



# BUDGET

- Average \$3 to \$5 per square foot (constructing the rain garden yourself without hiring a landscaper)
- Factors to consider:
  - Soil conditions
  - Desired plant species
  - Size/density of plants used
  - Curbing, storm drains, underdrains



# TYPICAL RAIN GARDEN COSTS

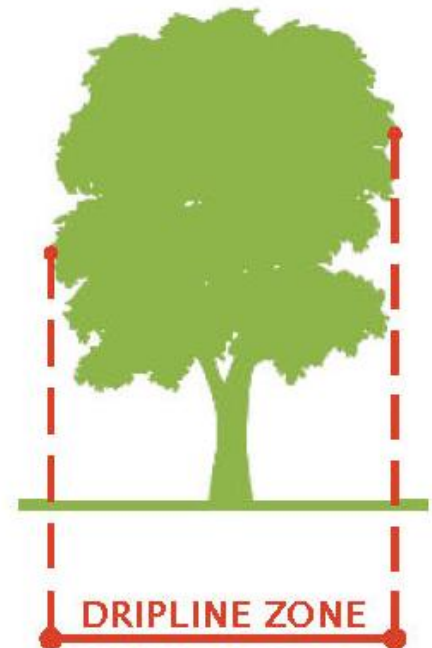
ITEM	COST
Rutgers Soil Test – Standard fertility test	\$20
Rutgers Soil Test – Soil texture analysis test	\$30
White mark-out paint	\$5.14
Good Quality Tall Fescue Grass Seed 50 lb. bag	\$73
Organic Blood Meal Fertilizer	\$5.47
Triple Shredded Mulch	\$30-\$40 per cubic yard
Coarse Bank Run Sand	\$30-\$35 per cubic yard
Top Soil	\$30-\$35 per cubic yard
Stone	\$25-\$30 per ton
Soaker Hose	\$15
Light Duty Garden House	\$25
TOTAL	\$313.61





# SITE SELECTION

1. Next to a building with a basement, rain garden should be located min. 10' from building; no basement: 2' from building
2. Do not place rain garden within 25' of a septic system
3. Do not situate rain garden in soggy places where water already ponds
4. Avoid seasonably-high water tables within 2' of rain garden depth
5. Consider flat areas first – easier digging
6. Avoid placing rain garden within dripline of trees
7. Provide adequate space for rain garden







# CALL BEFORE YOU DIG

## LOCATE YOUR UTILITY LINES!

*Call BEFORE You Dig!*

# 811

*The different colors of the markout flags represent specific utilities.*

	ELECTRIC
	GAS, OIL, STEAM
	COMMUNICATIONS, CATV
	WATER
	SEWER

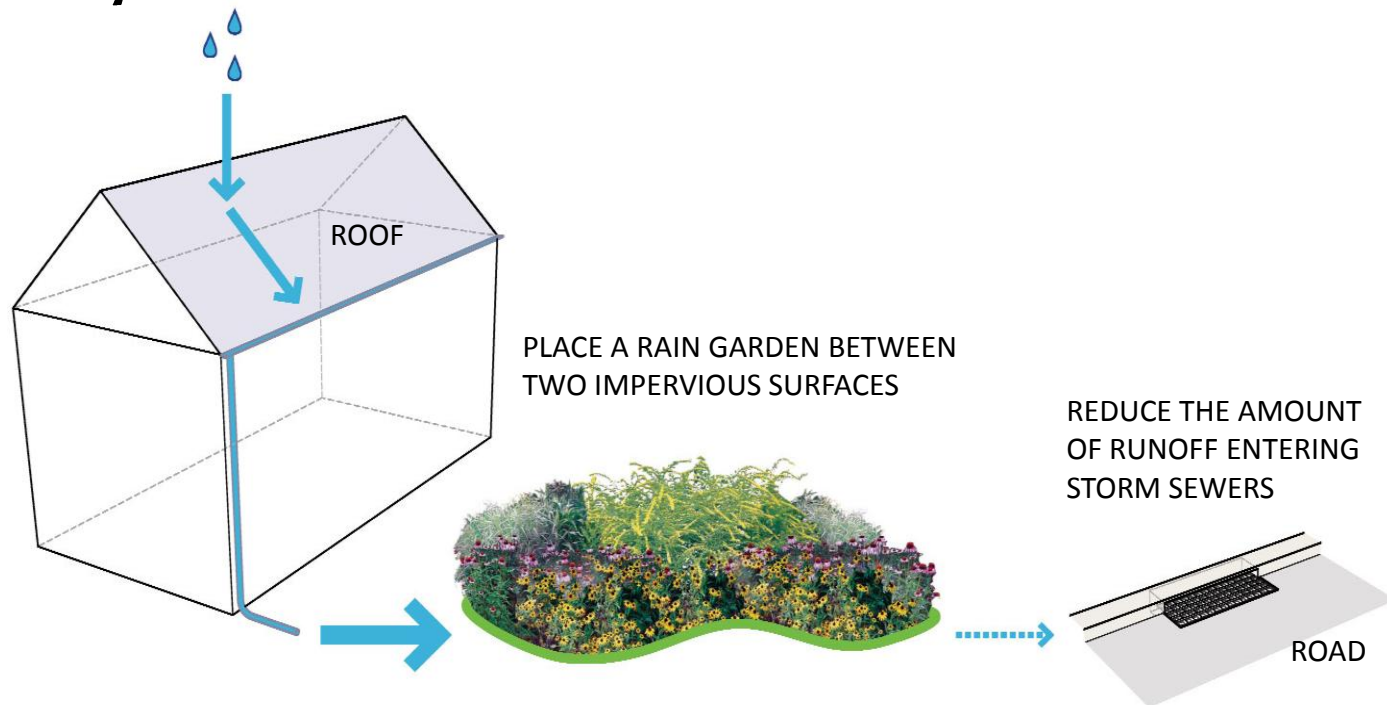
- Miss Utility of Delmarva
  - 1-800-282-8555
  - <http://www.missutility.net/>
- Free markout of underground gas, water, sewer, cable, telephone, and electric utility lines
- Call at least 3 full working days, but not more than 10 days, prior to planned installation date
- Do not place rain garden within 5' horizontally and 1' vertically from any utilities

# UNDERSTANDING YOUR PROPERTY



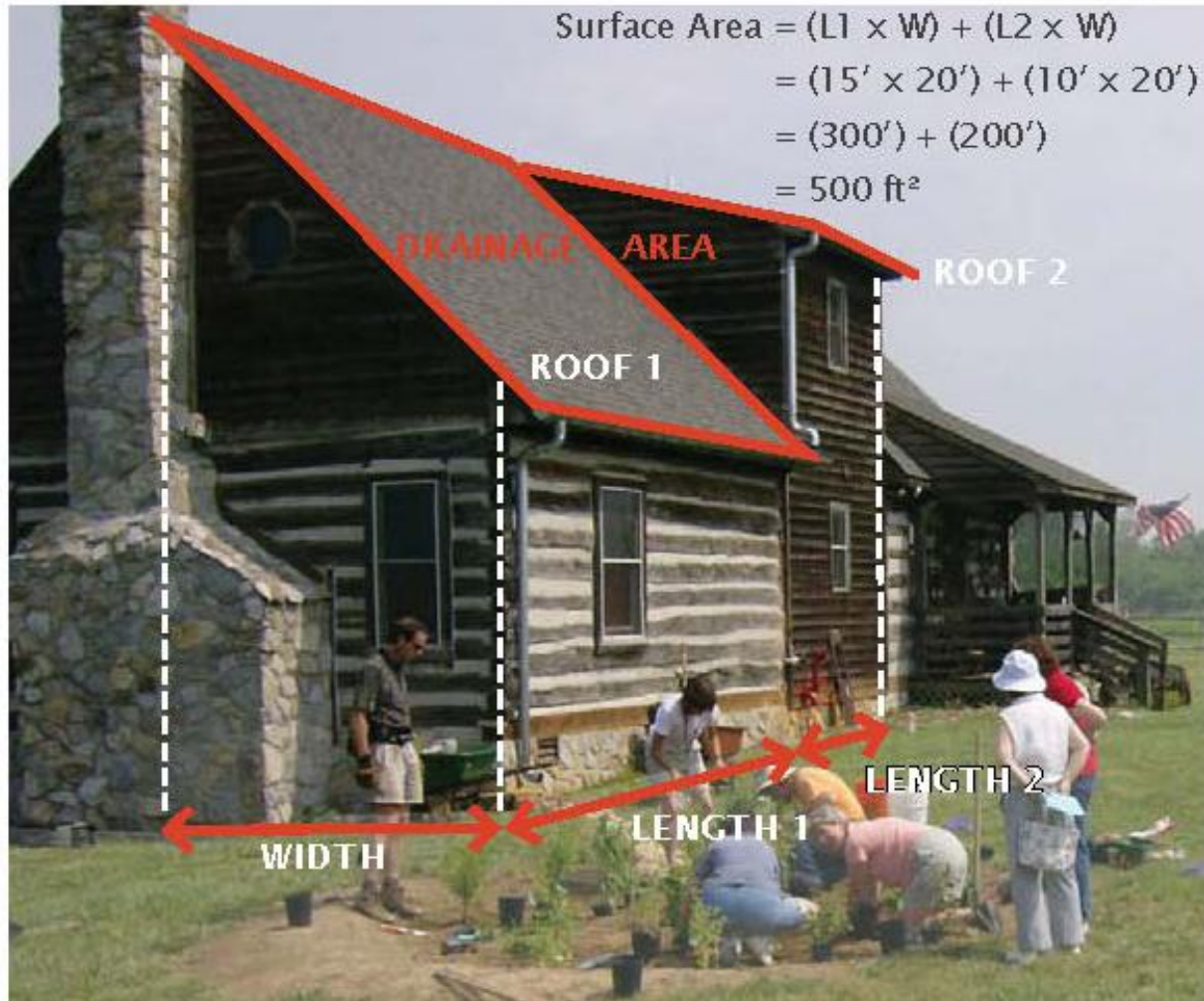
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- How does rainwater flow through your yard?
- Where does the runoff travel to once it leaves your yard?





# DRAINAGE AREA CALCULATION



# DRAINAGE AREA: THE ROOFTOP SCENARIO



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# DRAINAGE AREA: THE ROAD, DRIVEWAY, OR PARKING LOT SCENARIO



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A curb cut and a stone buffer provides the inlet for runoff to enter the rain garden from the adjacent roadway.

Lions Lake Park  
Voorhees, NJ

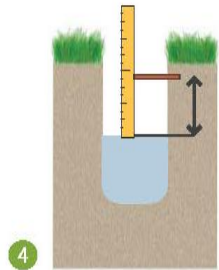
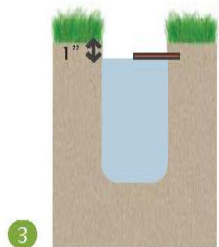
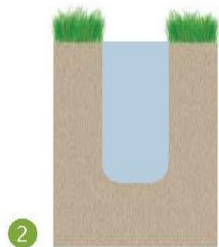
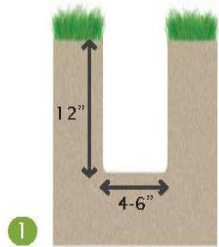


Make observations after a rainstorm to determine the direction of the runoff and the drainage area of the rain garden.





# CHECK YOUR SOIL



- Infiltration/Percolation Test
  1. Dig a hole in the proposed rain garden site (12" deep, 4-6" wide)
  2. Fill with water to saturate soil and then let stand until all the water has drained into the soil
  3. Once water has drained, refill the empty hole again with water so that the water level is about 1" from the top of the hole
  4. Check depth of water with a ruler every hour for at least 4 hours
  5. Calculate how many inches of water drained per hour



# CHECK YOUR SOIL

- Soil Test
  - The infiltration test will give an initial evaluation of the site's soil conditions
  - The soil test will give an accurate reading of the soil fertility, texture, mechanical



**RUTGERS**  
New Jersey Agricultural  
Experiment Station

Soil Testing Laboratory  
Rutgers, The State University  
P.O. Box 902  
Milltown, NJ 08850-0902  
Phone: (732) 932-9295

**Soil Test Report**  
Lab No: 2008-7162

Name: Rutgers University, Env. Science  
Chris Obrupe/Gregory Rusciano  
Address: 14 College Farm Road  
New Brunswick, NJ 08901  
Phone: (732) 932-2739  
Fax: (732) 932-8644  
Referred To: Rutgers Cooperative Ext.

Date Received: 10/02/2008  
Date Reported: 10/09/2008  
Serial No:  
Sample ID: Dorsett.

**Crop or Plant**  
New Perennial - Mixed Perennial

**Soil Tests and Interpretation**

pH: 5.90 Medium acidic; pH is slightly low for the growth of most crops except for acid-loving plants.

Lime Requirement Index: 7.85  
Adams-Evans LRI is a measure of the soil's buffering capacity (resistance to change in pH).  
It is used to determine liming rate, when necessary.

**Macronutrients (pounds/acre)**

Phosphorus: 607	(Above Optimum)	P	
Potassium: 176	(Optimum)	K	
Magnesium: 138	(Below Optimum)	Mg	
Calcium: 698	(Below Optimum)	Ca	

by Mehlich 3 extraction

**Micronutrients (parts per million)**

Zinc: 4.6 (Adequate)	Copper: 1.6 (Adequate)	Manganese: 7.5 (Adequate)	Boron: 5.9 (Adequate)	Iron: 211 (High)
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**Special Tests and Results**  
No special tests requested.

**Lime Recommendation**  
The soil test indicates a moderately acidic soil; the pH is below the best range for the growth of most Perennial. This soil should be treated with 15 pounds/1000 sq. ft. of limestone. Spread uniformly on the surface, then mix thoroughly to a 6 inch depth by shovel or by tilling.

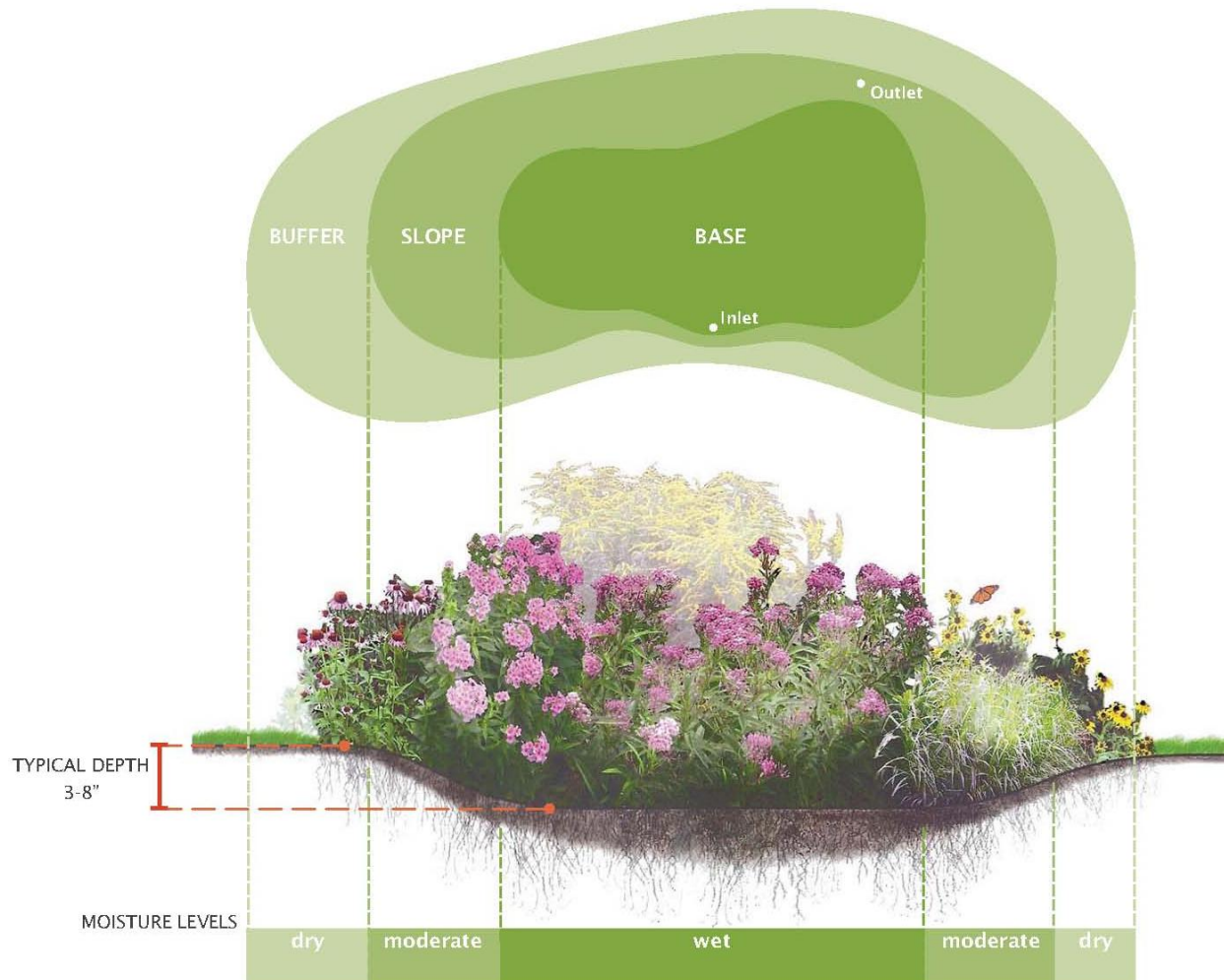
Soil Test Report for Lab No. 2008-7162



# DETERMINING THE DEPTH OF THE RAIN GARDEN



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# DETERMINING THE DEPTH OF THE RAIN GARDEN



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6" DEEP RAIN GARDEN - NO SOIL AMENDMENTS



3" DEEP RAIN GARDEN - SOIL AMENDMENTS



- Depth of rain garden is dependent upon the soil texture found at the site of the rain garden
- Depth is usually 3-8 inches

# DETERMINING THE SIZE OF THE RAIN GARDEN



- The size of the rain garden is dependent upon the amount of runoff entering the rain garden

Rain Garden Sizing Table Based on New Jersey's Water Quality Design Storm

Drainage Area	Size of 3" Deep Rain Garden CLAY SOIL*	Size of 6" Deep Rain Garden SILTY SOIL	Size of 8" Deep Rain Garden SANDY SOIL
500 ft <sup>2</sup>	200 ft <sup>2</sup>	100 ft <sup>2</sup>	75 ft <sup>2</sup>
750 ft <sup>2</sup>	350 ft <sup>2</sup>	150 ft <sup>2</sup>	112 ft <sup>2</sup>
1,000 ft <sup>2</sup>	400 ft <sup>2</sup>	200 ft <sup>2</sup>	149 ft <sup>2</sup>
1,500 ft <sup>2</sup>	600 ft <sup>2</sup>	300 ft <sup>2</sup>	224 ft <sup>2</sup>
2,000 ft <sup>2</sup>	800 ft <sup>2</sup>	400 ft <sup>2</sup>	299 ft <sup>2</sup>
* SOIL TEXTURE AMENDMENTS NEEDED			





# SOIL TEXTURE AMENDMENTS

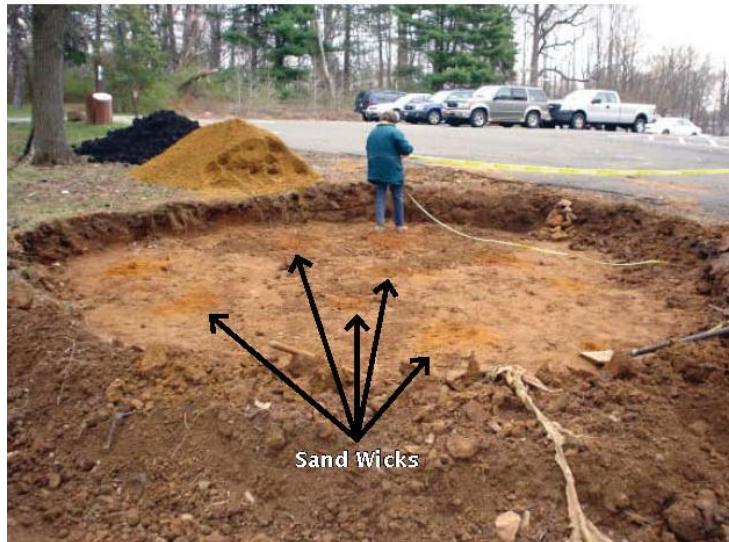
- Soil texture amendments improve the rain garden's infiltration rate.





# SOIL QUALITY AMENDMENTS

- Soil quality amendments improve the rain garden's growing conditions for plants
- Improve soil's nutrient capacity



## REMEMBER:

Your rain garden should NOT be permanently filled with water – it should drain within 24 hours.



# DETERMINING THE INLET AND OVERFLOW



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- Stormwater runoff enters the rain garden from an **inlet**
- Stormwater exits through the **overflow**







# PREVENTING EROSION

- Slope no greater than 3:1
- Slow down velocity of water flowing through rain garden
  - Add rocks to inlet area



# DETERMINING MULCH QUANTITY



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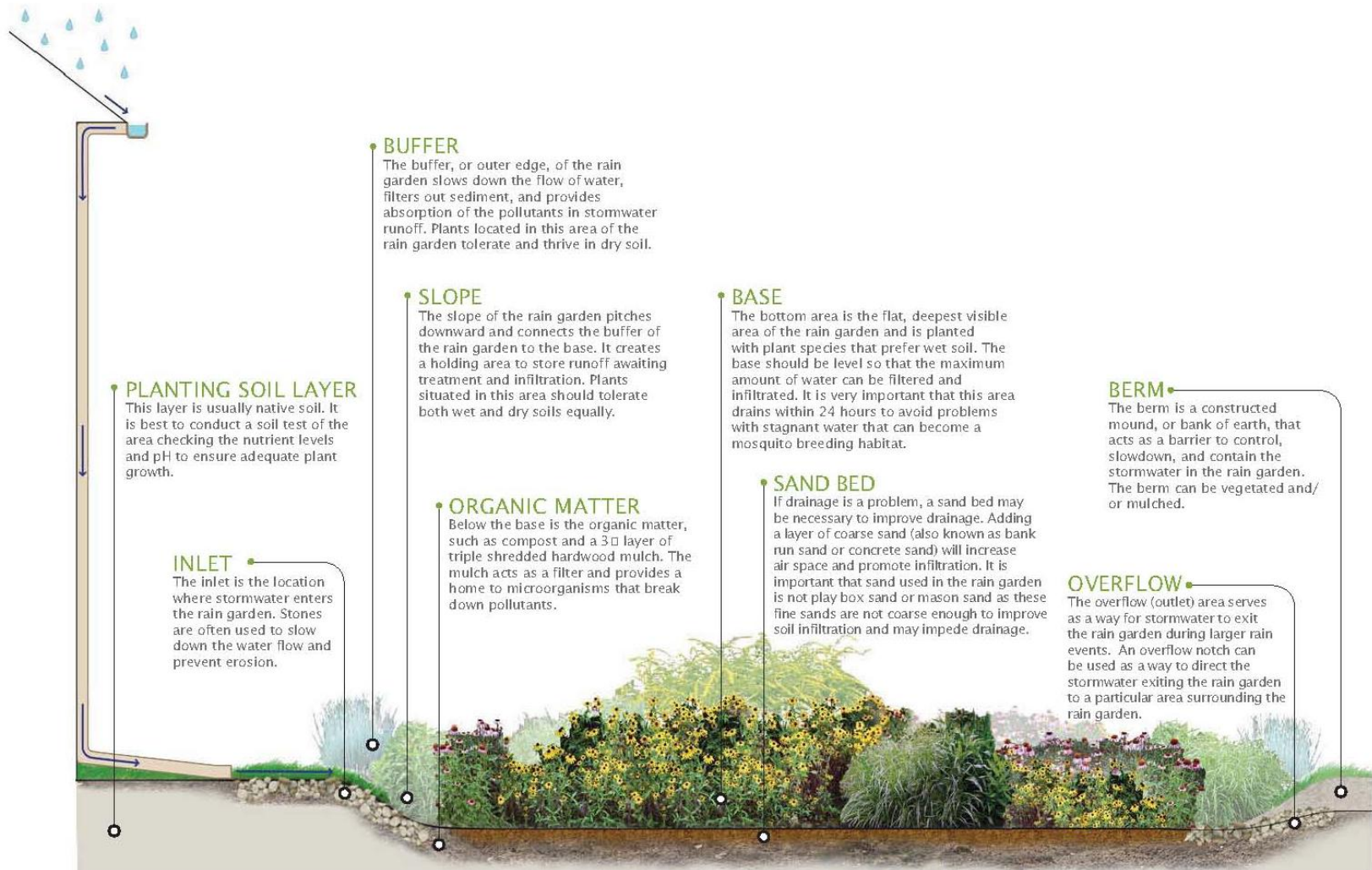
- Allow for a 3" depth mulch (triple-shredded hardwood with no dye) to be spread throughout the entire rain garden
- Every 100 square feet of rain garden needs 1 cubic yards (3" depth)







# PARTS OF A RAIN GARDEN



## • BUFFER

The buffer, or outer edge, of the rain garden slows down the flow of water, filters out sediment, and provides absorption of the pollutants in stormwater runoff. Plants located in this area of the rain garden tolerate and thrive in dry soil.

## • SLOPE

The slope of the rain garden pitches downward and connects the buffer of the rain garden to the base. It creates a holding area to store runoff awaiting treatment and infiltration. Plants situated in this area should tolerate both wet and dry soils equally.

## • BASE

The bottom area is the flat, deepest visible area of the rain garden and is planted with plant species that prefer wet soil. The base should be level so that the maximum amount of water can be filtered and infiltrated. It is very important that this area drains within 24 hours to avoid problems with stagnant water that can become a mosquito breeding habitat.

## • BERM

The berm is a constructed mound, or bank of earth, that acts as a barrier to control, slowdown, and contain the stormwater in the rain garden. The berm can be vegetated and/or mulched.

## • PLANTING SOIL LAYER

This layer is usually native soil. It is best to conduct a soil test of the area checking the nutrient levels and pH to ensure adequate plant growth.

## • INLET

The inlet is the location where stormwater enters the rain garden. Stones are often used to slow down the water flow and prevent erosion.

## • ORGANIC MATTER

Below the base is the organic matter, such as compost and a 3" layer of triple shredded hardwood mulch. The mulch acts as a filter and provides a home to microorganisms that break down pollutants.

## • SAND BED

If drainage is a problem, a sand bed may be necessary to improve drainage. Adding a layer of coarse sand (also known as bank run sand or concrete sand) will increase air space and promote infiltration. It is important that sand used in the rain garden is not play box sand or mason sand as these fine sands are not coarse enough to improve soil infiltration and may impede drainage.

## • OVERFLOW

The overflow (outlet) area serves as a way for stormwater to exit the rain garden during larger rain events. An overflow notch can be used as a way to direct the stormwater exiting the rain garden to a particular area surrounding the rain garden.



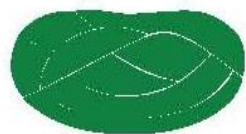
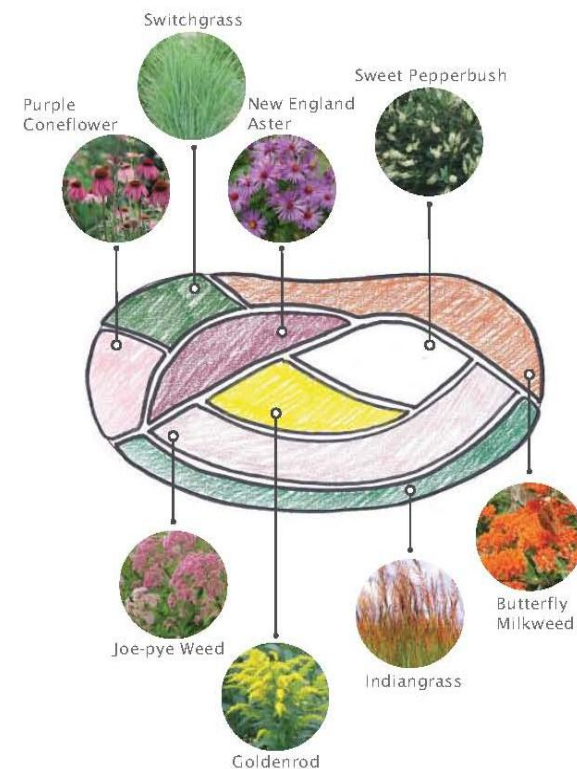


# RAIN GARDEN DESIGN

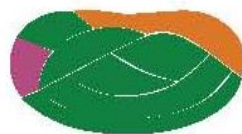
## SHAPING YOUR RAIN GARDEN

- Use a garden hose or rope to outline the desired shape of your rain garden on the ground
- Many rain gardens are in the shape of a circle or kidney bean, but your rain garden can take on whatever shape you prefer

Butterfly Habitat Rain Garden: Planting Plan



May



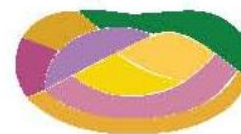
June



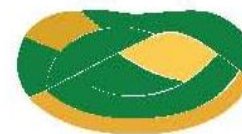
July



August



September



October

# SELECTING PLANTS FOR YOUR RAIN GARDEN



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- The success of your rain garden depends on selecting the right plants for the right place
- Plant your rain garden with plants adapted for your specific site
- **Native plants** can thrive without a lot of care, extra water, fertilizer, or pesticides
- **Native plants** are tolerant to dry and wet conditions



# PLANT SELECTION

- Select species based upon the following qualities:
  - Plant size
  - Moisture tolerances
  - Sun preferences
  - Plant aggressiveness
  - Salt tolerance
  - Habitat creation







# PLANTING DESIGN TIPS

- Plants that prefer wet conditions should be planted in the deepest part (the base) of the rain garden
- Create depth in the rain garden by placing large and tall plants in the back, smaller plants in the front
- Plant masses of the same species together in odd numbers
- Incorporate plants that have visual interest in the fall and winter
- Native plants provide habitat to animals and require less watering



THE FUN PART!

# INSTALLING YOUR RAIN GARDEN







# GETTING STARTED

- It is most effective to start the actual construction of the rain garden in the spring when the abundant rains will allow for best plant establishment and easier digging
- Summer/autumn start will also work, but the plants may need more watering until they become established







# INSTALLATION STEPS

1. Remove existing grass
2. Excavate to desired elevation and grade
3. Add soil amendments





# INSTALLATION STEPS

3. Prepare berm (if necessary)
4. Prepare overflow
5. Level the base (lowest area)





# INSTALLATION STEPS

6. Plant native species
7. Apply mulch
8. Water plants





# TOOLS & MATERIALS NEEDED



- Rakes and shovels
- Rototiller
- Wheelbarrow
- Triple-shredded hardwood mulch
- Plants
- Soil amendments, if necessary: fertilizer, pH adjustments (lime), coarse sand
- Optional: decorative stone, signage, seating, pipe extensions, pavers for path
- Work crew (friends, neighbors, and family)



# INSTALLATION SUMMARY

Delineate the rain garden, using either spray paint, a rope, or a garden hose.



Remove existing grass with either a shovel or machinery. If using machinery, the heavy weight of the machinery can compact the soil. Be sure to only run the machinery along the edge of the rain garden, not directly on top of it.



Dig the rain garden to its appropriate depth based upon the soil infiltration test.







# INSTALLATION SUMMARY

Add soil amendments if necessary. Use a rototiller or shovel to combine amendments with existing soil. Loosen and prepare the soil.



Shape the rain garden bed. Create a berm and an overflow area (outlet) for the water.



Level the base (lowest area) of the rain garden to prevent ponding. Use a ruler, two stakes, and something level to check for an even surface. If the base is not level, use a rake and shovel to smooth it out.







# INSTALLATION SUMMARY

Before planting, place each plant in the desired locations. Dig a hole of equal depth, but slightly wider, to the size of the container. Take the plant out of the container, loosen the roots, and plant.



Use empty plant containers to protect small plants. Apply two to three inches of mulch throughout the rain garden.



Water plants, either by installing a soaker hose or watering manually.





# INSTALLATION SUMMARY

At time of installation



First growing season



Second growing season



Photos courtesy of: United States Department of Agriculture and Madeline Flahive DiNardo





INSPECTION AND MAINTENANCE

# **MAINTAINING YOUR RAIN GARDEN**







# INITIAL THINGS TO CONSIDER

- A rain garden will not require as much care as lawn area but will need some maintenance to ensure long-term success
- Weekly maintenance: watering, weeding
- Annual maintenance: mulching, pruning, mowing, re-planting, soil testing



**REMEMBER:** Rain gardens are **LOW** maintenance gardens, not **NO** maintenance gardens!



# WEEKLY MAINTENANCE

- Water plants regularly, particularly during dry periods of the first growing season
- Remember that young, small plants are most vulnerable to stress
- Be careful that the plants don't get too wet or too dry



REMEMBER TO TAKE PICTURES BEFORE, DURING, AND AFTER INSTALLATION!







# WEEDING

- During the first few years, you will probably need to weed often during the growing season
- You will need to weed less and less as the plants grow and surpass the weeds
- Watch out for the most aggressive native plants and invasive weed species







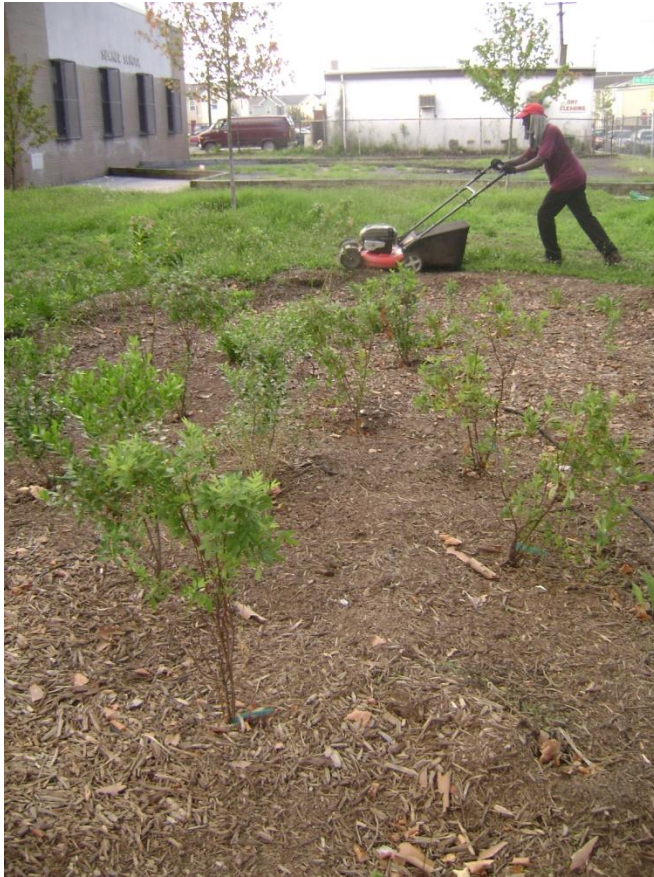
# ANNUAL MAINTENANCE

- **MULCHING**
  - Add mulch every spring to maintain a three inch mulch layer on your rain garden
- **PRUNING**
  - Each spring, prune dead vegetation, deadhead flowers, and cut back tattered or unwieldy plants
- **REPLANTING**
  - Remove or replace plant material that is not thriving





# ANNUAL MAINTENANCE



- **SEDIMENT REMOVAL**
  - Occasionally use a flat shovel to remove any excess sediment, leaves, or debris
- **SOIL TESTING**
  - Remember to retest the soil every 3-5 years and make appropriate amendments
- **FERTILIZING**
  - Fertilizing is NOT part of maintaining your rain garden!





# BEFORE/AFTER MAINTENANCE



**BEFORE**



**AFTER**





# A RAIN GARDEN OVER TIME



At time of installation

Springfield Township Municipal Annex Building  
Springfield, NJ



First growing season



Second growing season



Third growing season



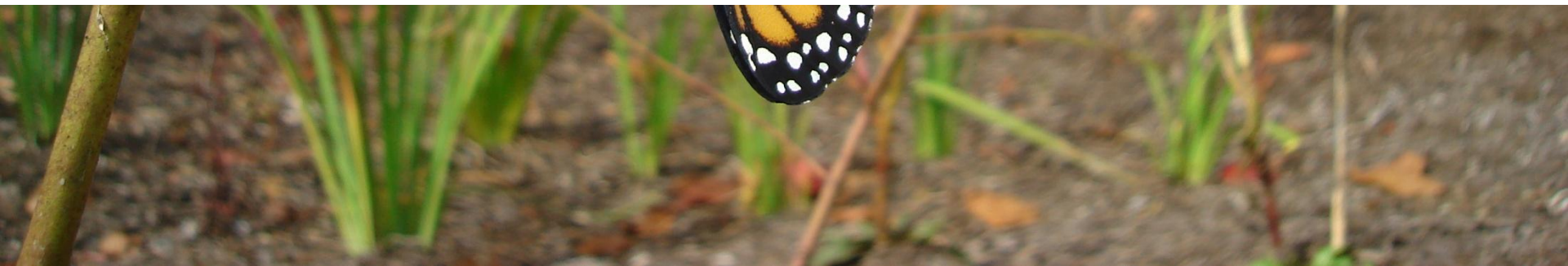
Fourth growing season





TAKING IT A STEP FURTHER

# CONCLUSION







# ENJOY YOUR RAIN GARDEN!

A rain garden not only adds a beautiful landscaping feature to your yard, but it also creates an area that will be fully functional at filtering nonpoint source pollution from stormwater runoff, the largest source of pollution in NJ waters.



(NJDEP, Bureau of Nonpoint Pollution Control, Division of Water Quality brochure)





# IT ALL ADDS UP

- In NJ, 90% of rainfall events are less than 1.25 inches, with approximately 44 total inches of rain per year. Therefore, your rain garden will treat and recharge 3.3 feet of water per year!
- Building 40 rain gardens in your community will treat and recharge 1,000,000 gallons of water per year!

